Biosolids Composting – Another Step in Guam's Zero Waste Plan

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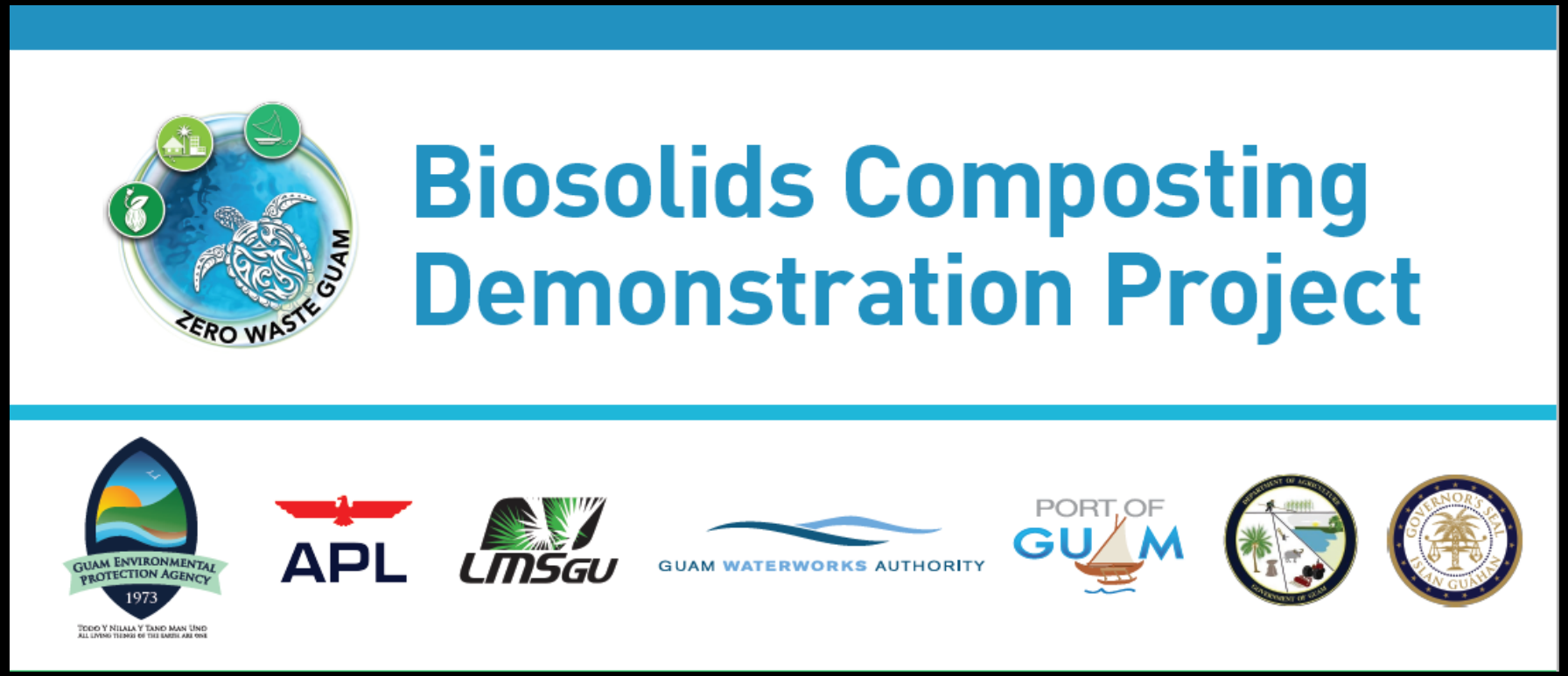
Assembly of Planners Symposium 2020

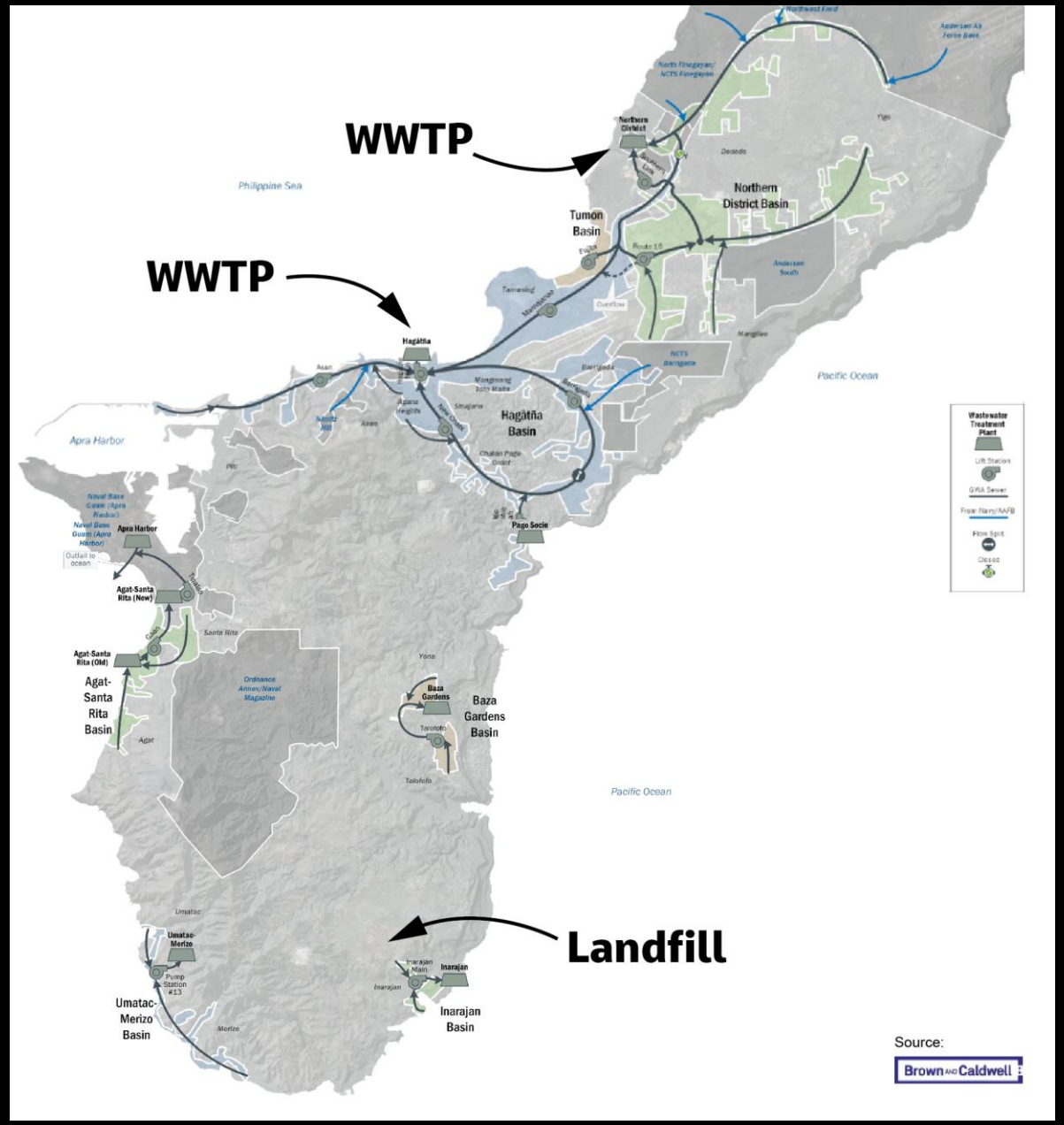
Jacobs

Biosolids Composting Demonstration Project



Potential Benefits of Composting Wastewater Solids on Guam

- Currently about 8,000 tons per year of wastewater solids is landfilled
- Reducing the amount of materials being landfilled by 10%
- Recycling of wood pallets as bulking agent
- Big step to achieve Zero Waste plan recycling goals
- Production of valuable fertilizer/soil amendment products
  - Reducing global carbon footprint instead of importing these products
- New DoD facilities can claim green credits for beneficial reuse of organics
- Stimulation of local businesses to operate facilities and sell products
- Savings in capital and operating costs vs. landfilling wastewater solids



Composting of Biosolids Makes Sense

- Major WWTP's, only one landfill
- Lengthy haul distances to landfill
- Compost can replace organics for soil improvement which are imported and expensive

Biosolids Composting Demonstration Project Goals

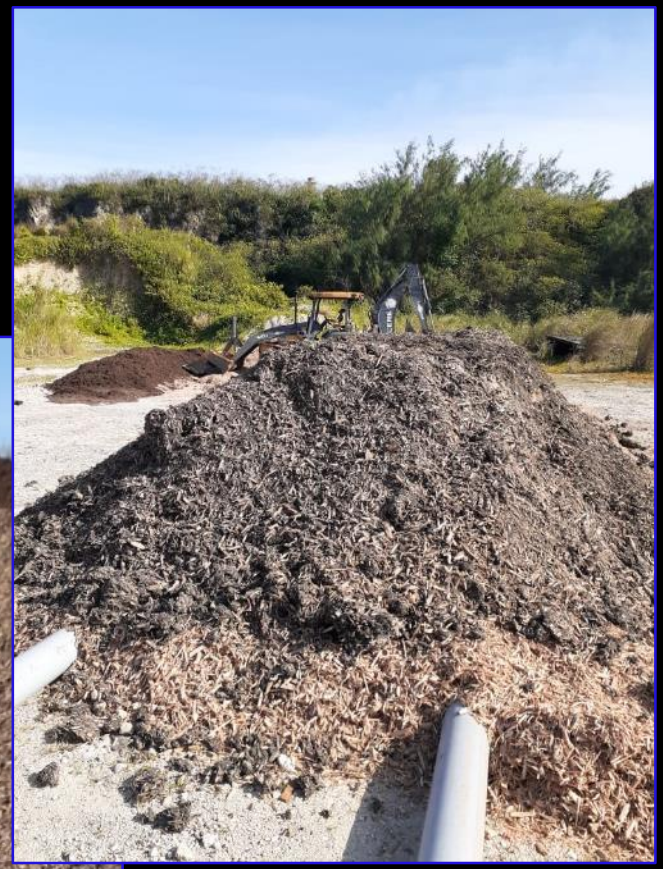
- Demonstration of Composting of Wastewater Solids
  - Measure input solids characteristics (%TS, nutrients, metals, PFAS)
  - Use ground pallets as bulking agent
  - Demonstrate EPA Part 503 Class A (PFRP and VAR) conditions are met
  - Demonstrate Class A EQ characteristics of compost (USCC STA testing plus PFAS)
  - Perform compost use demonstrations

Dewatered Solids Metals Content Measured 6/19

Parameter	EQ Pollutant Conc. Limit	Northern	% of Limit	Hagatna	% of Limit	Average	% of EPA EQ Limit
METALS (Dry Weight)	Mg/Kg	Mg/Kg	Mg/Kg	Mg/Kg	Mg/Kg	**Mg/Kg**	
Arsenic	**41**	2.47	6%	2.74	7%	**3**	**6%**
Cadmium	**39**	1.45	4%	0.8	2%	**1**	**3%**
Copper	**1500**	378	25%	354	24%	**366**	**24%**
Lead	**300**	25.4	8%	19	6%	**22**	**7%**
Mercury	**17**	0.58	3%	1.45	9%	**1**	**6%**
Nickel	**420**	15.4	4%	29.1	7%	**22**	**5%**
Selenium	**100**	4.2	4%	2.78	3%	**3**	**3%**
Zinc	**2,800**	805	29%	803	29%	**804**	**29%**

Composting Demonstration Details

- Processing undigested dewatered cake from the two largest plants (98% of all solids produced on Guam)
  - Northern District (31%TS)
  - Hagatna (21%TS)
- Measured material volumes, densities, pile temperatures, and aeration rates
- 28 CY of sludge (22 tons) and about 54 CY of ground pallets (10 tons) were used to build the demonstration pile



Construction of Demonstration Pile

Constructed Compost Demonstration Pile

Simple Positive Aeration System

Pile Monitoring

GUAM COMPOST DEMO PILE DATA SHEET Date_____

	%TS	Bulk Density	TONS	CALCULATED BA:SL RATIO (Gravimetric)	0.49:1		WET TONS SOLIDS _____20.3__
SOLIDS NORTH	31		9.8	OPERATOR SET POINT: BA:SL RATIO	_____:1		DRY[3] TONS SOLIDS _____5.3
SOLIDS AGANA	21		10.5				
WOOD CHIPS			9.9				
B.A. A _____							
B.A. B _____				BASE MATERIAL USED - chips			
INITIAL MIX TOTAL			30.2	COVER MATERIAL USED – ground green waste			

NOTES: [1]- BA/SL Ratio = Total Tons Bulking Agent/Tons SOLIDS
[3]- Dry Tons = Wet Tons x % TS/100

COMMENTS: Mark Gogue took pile temperatures and made aeration adjustments daily for duration of demo.

Date	Day	Temperatures (°F) PT1 (blower)	PT2 (BL)	PT3 (BR)	PT4 (end)	ORIFICE	CURE TEMP	Comments	Pile Temps from 2/5 at points 1 & 4
1/14	00							Pile constructed	
1/15	01	135	146	145	144	2"		Fan tuned on	
1/16	02	153	144	156	150	2"		Fan was found off…turned back on	
1/17	03	150	144	142	143	2"		Met PFRP Fan was found off…turned back on	
1/18	04	130	125	136	126	1-1/8"		Reduced orifice opening to half with duct tape	
1/19	05	138	125	142	144	½"			
1/20	06	144	142	146	144	½"			
1/21	07	126	120	126	122	½"		Turned fan off	
1/22	08	124	122	120	108	NA		Fan off but running backwards indicating negative airflow	
1/23	09	150	150	136	118	NA		At end of day, added 650 gallons water to pile	
1/24	10	152	146	153	144	NA			
1/25	11	152	148	154	154	NA			
1/26	12	148	138	148	146	NA			
1/27	13	142	136	141	142	NA		Rainy Day	
1/28	14	142	138	146	142	NA			
1/29	15	146	143	146	142	2"		Fan on for 7 hours then turned off again.	
1/30	16	128	118	124	118	NA			
1/31	17	135	126	143	126	NA			
2/1	18	143	135	142	132	NA			
2/2	19	125	120	120	115	NA			
2/3	20	112	112	94	105	NA			
2/4	21	122	118	102	122	NA			

		PT1	PT2	PT3	PT4
PFRP (≥3)	TOTAL DAYS ABOVE 55ºC (131ºF)	14	12	15	12
VAR (≥14)	TOTAL DAYS ABOVE 40ºC (104ºF)	21	21	19	21

PILE TEARDOWN	DATE	%TS

2/4/2020

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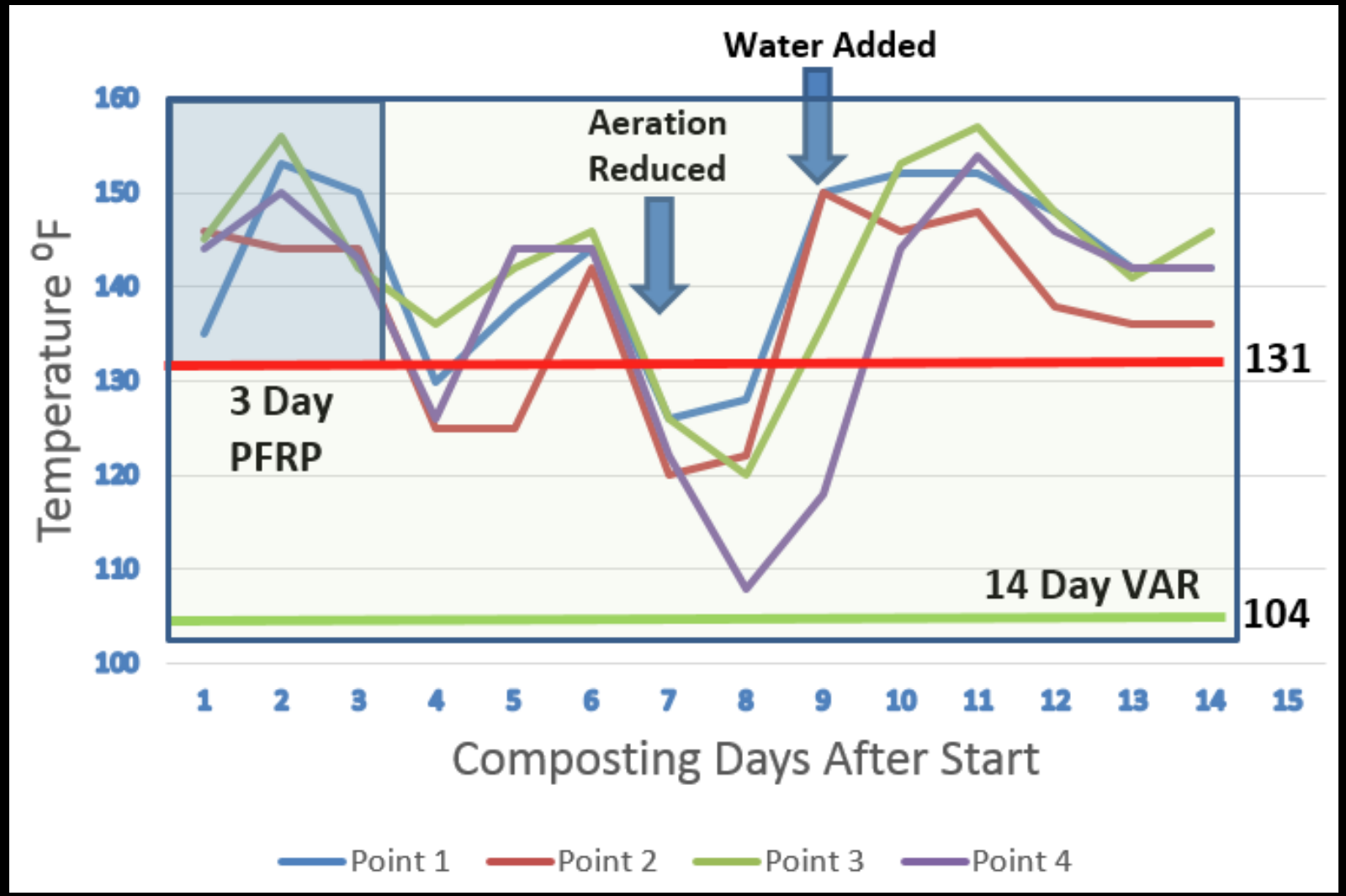
ZERO WASTE GUAM

Temperatures Demonstrating US EPA Compliance Part 503 Rules for Class A – Both PFRP and VAR



Demonstration Pile Construction

Anticipated Next Steps

Demonstration project is in progress

Full testing of compost product to be done in next 2 months

Product testing results to be reviewed by Guam EPA

Compost use demonstrations will follow

Development of plan to construct and operate full scale facilities

Identify facility sizing and costs

Identify partners to build and operate

Design, finance and build one or more full scale facilities

What does the foremost biosolids researcher say about the risk of using biosolids compost?

"Well operated biosolids composting facilities can achieve low odor and generate valuable products with reduced costs of wastewater treatment. Composting kills pathogens during the active treatment period, and further allows die off during the curing period. Modern biosolids which comply with the [EPA] APL quality limit, or Exceptional Quality description are not a risk to children which ingest soil or products, or ingest for a lifetime garden foods grown on compost amended soils. Many of the xenobiotics are degraded during composting, and the concentrations in finished composts are no risk to the general environment or exposed humans."

- Dr. Rufus Chaney, ARS-USDA, 2013

Dr. Rufus L. Chaney is a Senior Research Agronomist in the Environmental Management and By-Product Utilization Laboratory of the USDA-Agricultural Research Service at Beltsville, MD, where he conducts research on the fate, food-chain transfer, and potential effects, and remediation of hazards from soil microelements. Since beginning his career in 1969, Dr. Chaney has 429 published papers and 267 published abstracts on these topics.

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Thank You

QUESTIONS?

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Reinventing tomorrow.